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| Name of Course: | DRONE TECHNICIAN CUM OPERATOR |
| Duration of Course: | 300 Hours Includes 180 Hours of Theory and 120 Hours of Practical |
| Examination: | 200 Marks Includes 80 Marks for Theory and 120 Marks for Practical |
| Batch Size: | 30 |
| Entry Qualification for Admission | Graduate or Diploma in Engineering/ Technology/ Science or ITI |
| Admission Fees: | Rs. 150 |
| Examination Fees: | Rs. 550 |
| Instructor Qualification: | B.E/B.Tech (A.E/M.E/C.S/E.C/E.E/E.E.E) with experience in Drone Technology |
| Space Norms for Workshop: | 50 Sq. Meter |
| Power Norms for Workshop: | 2 KW |
| Equipments: | Propellers, ESC, Lipo Battery, Control Board, Carbon Fiber Structure, Lipo Charger, Brushless Motors, Multimedia Project |
| Hand Tools: | Pliers, Control Rods, Cutter, Scissors, Ruler, Pencils, Clippers, Soldering Iron |

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SYLLABUS

UNIT 1: DESIGN & DOCUMENTATION – 10 HOURS

Unit 1 Vocabulary

Unit 1 Concepts

Unit 1 Performance Objectives

- 1.1 What is Engineering?
- 1.2 Engineering Design
- 1.3 The Design Process
- 1.4 Importance of Documentation
- 1.5 Working in Teams
- 1.6 Effective Team Practices
- 1.7 Quantitative vs. Qualitative Arguments
- 1.8 Engineering Notebooks
- 1.9 Software and Tools for Drone Design

Unit 1 Summary

UNIT 2: SAFETY CONSIDERATIONS – 10 HOURS

Unit 2 Vocabulary

Unit 2 Concepts

Unit 2 Performance Objectives

- 2.1 Safety First
- 2.2 Your Safety Responsibility
- 2.3 Establishing a Safety Culture
- 2.4 Workshop Safety Issues
- 2.5 Workshop Safety Rules
- 2.6 Soldering Safety Rules
- 2.7 Increase Your Drone Design Knowledge
- 2.8 Increase Your Flight Skills
- 2.9 Flight Safety Organizations
- 2.10 Educational Regulations
- 2.11 Drone Registration
- 2.12 Definition of Recreational Use
- 2.13 Safety Guidelines for sUAS Recreational Users
- 2.14 Privacy Policy
- 2.15 Safe Flying Locations
- 2.16 No-Fly Zones
- 2.17 Safe Weather Conditions
- 2.18 Safe Flight Clearance
- 2.19 Visual Line of Sight
- 2.20 Start Out Slowly
- 2.21 Ground Effect & Prop Wash
- 2.22 Propeller Dangers
- 2.23 Pre-Flight Inspection

Unit 2 Summary

UNIT 3: INTRODUCTION TO DRONES – 10 HOURS

Unit 3 Vocabulary

Unit 3 Concepts

Unit 3 Performance Objectives

- 3.1 What is a Drone?
- 3.2 Drone Uses Besides Aerial
- 3.3 Brief History of Aerial Drones
- 3.4 Drone Reputation
- 3.5 Development of Small UAVs
- 3.6 What's in a Name?
- 3.7 Types of Small UAVs (sUAV)
- 3.8 Choosing a Multicopter Configuration
- 3.9 Drone Components
- 3.10 Current Uses and Future Potential

Unit 3 Summary

UNIT 4: FUNDAMENTALS OF FLIGHT – 5 HOURS

Unit 4 Vocabulary

Unit 4 Concepts

Unit 4 Performance Objectives

- 4.1 What is Aerodynamics?
- 4.2 Brief History of Flight
- 4.3 Newton's Laws of Force and Motion
- 4.4 Bernoulli's Principle
- 4.5 Airfoils
- 4.6 Four Forces of Flight
- 4.7 Mechanical Design of an Airplane
- 4.8 Three Axes of Flight
- 4.9 Airspace
- 4.10 Traffic Patterns and Minimum Safe Altitudes
- 4.11 Weather Factors for Drone Flight
- 4.12 Pilot-in-Command/Remote Pilot-in-Command
- 4.13 How Multicopters Fly
- 4.14 Vectors Applied to Flight Physics
- 4.15 Calculating Values of Combined Maneuvers

Unit 4 Summary

UNIT 5: AIRFRAMES – 5 HOURS

Unit 5 Vocabulary

Unit 5 Concepts

Unit 5 Performance Objectives

- 5.1 Airframe Characteristic
- 5.2 History of Helicopter Design
- 5.3 Early Multirotor Aircraft Design
- 5.4 Advancements in Control and Design
- 5.5 Multirotor Configurations
- 5.6 Choosing/Building a Multicopter Configuration
- 5.7 Airframe Sizes
- 5.8 Airframe Materials
- 5.9 Tensile Strength

Unit 5 Summary

UNIT 6: ELECTRIC MOTORS – 5 HOURS

Unit 6 Vocabulary

Unit 6 Concepts

Unit 6 Performance Objectives

- 6.1 Introduction to Electric Motors
- 6.2 Brief History of the Electric Motor
- 6.3 AC/DC Motor Differences
- 6.4 Brushed vs. Brushless DC Motors
- 6.5 Classification of Load Capability (Kv rating)
- 6.6 Calculation of Motor Ratings
- 6.7 Choosing the Best Motors for Your Needs
- 6.8 Sample Build for Determining Motors Unit 6 Summary

UNIT 7: PROPELLERS – 10 HOURS

Unit 7 Vocabulary

Unit 7 Concepts

Unit 7 Performance Objectives

- 7.1 Introduction to Propellers
- 7.2 History of Propeller Design
- 7.3 Propeller Design Theory
- 7.4 Fixed Pitch, Variable-Pitch, and Constant Speed Blades
- 7.5 Size, Pitch, Direction, and Blade-count
- 7.6 Safety and Use of Prop Guards
- 7.7 Balancing Your Propellers
- 7.8 Materials Used in Prop Construction
- 7.9 Choosing Your Propellers
- 7.10 Using eCalc© to Determine Best Prop Selection

Unit 7 Summary

UNIT 8: ELECTRONIC SPEED CONTROLLERS (ESCs) – 10 HOURS

Unit 8 Vocabulary

Unit 8 Concepts

Unit 8 Performance Objectives

- 8.1 Introduction to ESCs
- 8.2 How ESCs Work
- 8.3 ESC Ratings: Amperage and Voltage
- 8.4 Calibrating and Programming ESCs
- 8.5 Firmware Options (SimonK / BLHeli)
- 8.6 A Few More Considerations
- 8.7 Mounting Your ESCs

Unit 8 Summary

UNIT 9: FLIGHT CONTROLLERS – 10 HOURS

Unit 9 Vocabulary

Unit 9 Concepts

Unit 9 Performance Objectives

- 9.1 Introduction to Flight Controllers
- 9.2 How They Work
- 9.3 Sensors and Guidance Systems
- 9.4 Autonomous Flight
- 9.5 Sense-and-Avoid Technology
- 9.6 Determining Your Flying Purpose
- 9.7 Comparing Flight Controllers
- 9.8 Open Source vs. Closed Source

Unit 9 Summary

UNIT 10: BATTERIES, CHARGERS, & CONNECTORS – 10 HOURS

Unit 10 Vocabulary

Unit 10 Concepts

Unit 10 Performance Objectives

- 10.1 Batteries Defined
- 10.2 A Brief History of Batteries
- 10.3 Anatomy of a Battery
- 10.4 Battery Reactions and Chemistry
- 10.5 Battery Purposes
- 10.6 Battery Arrangement and Power
- 10.7 Rechargeable Batteries
- 10.8 LiPo Batteries: The Power of Choice for Drones
- 10.9 LiPo Battery Characteristics
- 10.10 LiPo Cell Balancing
- 10.11 LiPo Chargers
- 10.12 LiPo Bags
- 10.13 Keeping Tabs on your Battery's Health
- 10.14 Connectors

Unit 10 Summary

UNIT 11: TRANSMITTERS & RECEIVERS – 10 HOURS

Unit 11 Vocabulary

Unit 11 Concepts

Unit 11 Performance Objectives

- 11.1 What is a Radio Control System?
 - 11.2 History of Radio Control
 - 11.3 Controllers / Transmitters
 - 11.4 Receivers
 - 11.5 Most Common Frequency Bands
 - 11.6 Control Station Setup and Programming
- Unit 11 Summary

UNIT 12: CAMERAS, GIMBALS & OTHER PAYLOADS – 5 HOURS

Unit 12 Vocabulary

Unit 12 Concepts

Unit 12 Performance Objectives

- 12.1 Payload Considerations
 - 12.2 Camera Options
 - 12.3 Camera Resolution
 - 12.4 Camera Sensors
 - 12.5 Still Photography
 - 12.6 Video Photography
 - 12.7 Live Video Output
 - 12.8 Vibration Isolation, Prop Balancing, and Jelló Effect
 - 12.9 Gimbals
 - 12.10 Camera Lenses
 - 12.11 Exposure Settings
 - 12.12 Video Frame Rate
 - 12.13 Saving Digital Files (RAW, DNG, JPEG, H.264, MP4, MOV)
 - 12.14 Delivery Payloads and Other Possibilities
- Unit 12 Summary

UNIT 13: GROUND CONTROL STATIONS & FPV – 10 HOURS

Unit 13 Vocabulary

Unit 13 Concepts

Unit 13 Performance Objectives

- 13.1 What is a Ground Control Station?
- 13.2 Telemetry
- 13.3 History of Telemetry
- 13.4 Data Tracking
- 13.5 Mission Planning
- 13.6 3D Mapping and Modeling
- 13.7 FPV and Drone Racing Unit 13 Summary

UNIT 14: ASSEMBLY & MRO – 60 HOURS

Unit 14 Vocabulary

Unit 14 Concepts

Unit 14 Performance Objectives

- 14.1 Assembly requirements
- 14.2 Avionics assembly
- 14.3 Structural Assembly
- 14.4 Disassembly of Drone
- 14.5 Basics of structure maintenance
- 14.6 Drone repair

UNIT 15: DRONE MAINTENANCE & BATTERY CARE – 10 HOURS

Unit 15 Vocabulary

Unit 15 Concepts

Unit 15 Performance Objectives

- 15.1 The Commonality of Drones
- 15.2 Drone Maintenance
- 15.3 Create a Pre-Flight Checklist
- 15.4 Software and Firmware Maintenance
- 15.5 Logging Your Flights
- 15.6 Documenting Your Logs
- 15.7 LiPo Battery Maintenance and Care
- 15.8 LiPo Chargers Revisited
- 15.9 Use of LiPo Bags
- 15.10 Charging Temperatures
- 15.11 Charging Rates
- 15.12 Discharging Rates
- 15.13 Working Temperatures
- 15.14 Battery Puffing
- 15.15 "Breaking-in" New LiPo Batteries
- 15.16 Handling Damaged LiPo Batteries
- 15.17 Storage and Shelf-Life of your LiPo Battery
- 15.18 The 80% Rule: Retiring LiPo Batteries
- 15.19 Disposal of LiPo Batteries

Unit 15 Summary

UNIT 16: VR & FLYING TRAINING – 120 HOURS

Unit 16 Introduction

Unit 16 Concepts

Unit 16 Virtual Reality training

- 16.1 Practical fabrication
- 16.2 Designing
- 16.3 Avionics Configuration
- 16.4 Drone Live flying training

Unit 16 Summary